CLAIMS

What is claimed is:

1 1.   A method comprising the computer-implemented steps of:

2   gathering statistics about XML resources that are stored in a database repository;

3   storing said statistics; and

4   in response to a request for access to one or more XML resources from said database

5   repository, computing a computational cost associated with each of one or

6   more methods of accessing said one or more XML resources from said

7   database repository, based on said statistics.

1 2.   The method of Claim 1, wherein said XML resources are logically organized in a

2   hierarchy of nodes in which each node is either a container or a resource, and

3   wherein the step of gathering statistics comprises gathering one or more data from a

4   group consisting of

5   a total number of nodes in said hierarchy that are accessible via a path through

6   a specified node,

7   a total number of containers in said hierarchy that are accessible via a path

8   through said specified node,

9   a total number of nodes in said hierarchy that are accessible via a path through

10   said specified node and that are in a level of said hierarchy that is

11   immediately under a level of said specified node,

12   a total number of containers in said hierarchy that are accessible via a path

13   through said specified node and that are in a level of said hierarchy

14   that is immediately under said level of said specified node, and

-23-

15   a number of levels from a root node of said hierarchy, at which said specified

16   node is organized in said hierarchy.

1 3. The method of Claim 1, wherein said XML resources are logically organized in a

2   hierarchy of nodes in which each node is either a container or a resource, and

3   wherein the step of gathering statistics comprises gathering each of

4   a total number of nodes in said hierarchy that are accessible via a path through

5   a specified node,

6   a total number of containers in said hierarchy that are accessible via a path

7   through said specified node,

8   a total number of nodes in said hierarchy that are accessible via a path through

9   said specified node and that are in a level of said hierarchy that is

10   immediately under a level of said specified node,

11   a total number of containers in said hierarchy that are accessible via a path

12   through said specified node and that are in a level of said hierarchy

13   that is immediately under said level of said specified node, and

14   a number of levels from a root node of said hierarchy, at which said specified

15   node is organized in said hierarchy.

1 4. The method of Claim 1, wherein the step of storing statistics comprises storing said

2   statistics in a relational table of a database of which said database repository is part.

1 5. The method of Claim 4, wherein said relational table is a first relational table that is a

2   different table than a second relational table in which said XML resources are stored

3   in said database repository.

1   6.   The method of Claim 4, wherein said relational table is a relational table in which

2   said XML resources are stored in said database repository.

1   7.   The method of Claim 1, wherein the step of storing statistics comprises storing said

2   statistics in a hierarchical index table in which said XML resources are indexed to

3   said database repository.

1   8.   The method of Claim 1, wherein the step of computing a computational cost

2   comprises computing a selectivity value for each of one or more predicates, from said

3   request, that contain operators on said database repository.

1   9.   The method of Claim 8, wherein each of said XML resources is logically organized in

2   a hierarchy of nodes and stored, in association with a location of said XML resource

3   in said hierarchy, in a column of a table in said database repository, and wherein said

4   operator is an operator that determines whether a particular XML resource can be

5   located in said database repository through a particular specified path through a

6   portion of said hierarchy.

1   10.   The method of Claim 8, wherein each of said XML resources is logically organized in

2   a hierarchy of nodes and stored, in association with a location of said XML resource

3   in said hierarchy, in a column of a table in said database repository, and wherein said

4   operator is an operator that determines whether a particular XML resource can be

5   located in said database repository at a terminal location of a particular specified path

6   through a portion of said hierarchy.

1   11.   The method of Claim 1, wherein the step of computing a computational cost

2   comprises computing a computational cost of traversing, to locate a particular XML

3   resource specified in said request, an index in which said XML resources are indexed

4   to said database repository.

1   12.   The method of Claim 11, wherein computing said computational cost of traversing an

2   index comprises computing a computational cost associated with one or more CPUs

3   used for said traversing.

1   13.   The method of Claim 11, wherein computing said computational cost of traversing an

2   index comprises computing a computational cost associated with reading data blocks

3   in which portions of said index are stored.

1   14.   The method of Claim 11, wherein computing said computational cost of traversing an

2   index comprises computing (a) a computational cost associated with one or more

3   CPUs used for said traversing and (b) a computational cost associated with reading

4   data blocks in which portions of said index are stored.

1   15.   The method of Claim 1, wherein the step of computing a computational cost

2   comprises (a) computing a selectivity value for each of one or more predicates, from

3   said request, that contain operators on said database repository and (b) computing a

4   computational cost of traversing, to locate a particular XML resource specified in said

5   request, an index in which said XML resources are indexed to said database

6   repository.

1   16.   The method of Claim 1, wherein said request for access to one or more XML

2   resources from said database repository is a SQL query.

1   17.   The method of Claim 16, wherein each of said XML resources is logically organized

2   in a hierarchy of nodes and stored, in association with a location of said XML

3   resource in said hierarchy, in a column of a table in said database repository, and

4   wherein said SQL query comprises a mechanism for providing one possible path

5   through said hierarchy to each of said XML resources.

1   18.   The method of Claim 17, wherein the step of computing a computational cost

2   comprises computing a computational cost component for one or more predicates,

3   from said request, that contain an operator in conjunction with said mechanism acting

4   on said database repository.

1   19.   The method of Claim 16, wherein each of said XML resources is logically organized

2   in a hierarchy of nodes and stored, in association with a location of said XML

3   resource in said hierarchy, in a column of a table in said database repository, and

4   wherein said SQL query comprises a mechanism for providing all possible paths

5   through said hierarchy to each of said XML resources.

1   20.   The method of Claim 19, wherein the step of computing a computational cost

2   comprises computing a computational cost component for one or more predicates,

3   from said request, that contain an operator in conjunction with said mechanism acting

4   on said database repository.

50277-2433
(OID 2003-333-01)

1   21.   The method of Claim 1, wherein said database repository is part of a relational

2   database management system.

1   22.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 1.

1   23.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 2.

1   24.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 3.

1   25.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 4.

1   26.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 5.

1   27.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 6.

1   28.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 7.

1   29.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 8.

1   30.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 9.

1   31.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 10.

1   32.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 11.

1   33.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 12.

1   34.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 13.

1　35.　A computer-readable medium carrying one or more sequences of instructions which,

2　　　when executed by one or more processors, causes the one or more processors to

3　　　perform the method recited in Claim 14.

1　36.　A computer-readable medium carrying one or more sequences of instructions which,

2　　　when executed by one or more processors, causes the one or more processors to

3　　　perform the method recited in Claim 15.

1　37.　A computer-readable medium carrying one or more sequences of instructions which,

2　　　when executed by one or more processors, causes the one or more processors to

3　　　perform the method recited in Claim 16.

1　38.　A method comprising the computer-implemented steps of:

2　　　gathering, by a database management system, statistics about XML resource that are

3　　　　　stored in a repository of said database management system; and

4　　　storing said statistics in said database management system.

1　39.　The method of Claim 38, wherein the step of storing comprises storing said statistics

2　　　as XML data type in a schema-based table in said database management system.

1　40.　The method of Claim 38, wherein said XML resources are logically organized in a

2　　　hierarchy of nodes in which each node is either a container or a resource, and

3　　　wherein the step of gathering statistics comprises gathering each of

4　　　　　a total number of nodes in said hierarchy that are accessible via a path through

5　　　　　　a specified node,

6   a total number of containers in said hierarchy that are accessible via a path

7   through said specified node,

8   a total number of nodes in said hierarchy that are accessible via a path through

9   said specified node and that are in a level of said hierarchy that is

10   immediately under a level of said specified node, and

11   a total number of containers in said hierarchy that are accessible via a path

12   through said specified node and that are in a level of said hierarchy

13   that is immediately under said level of said specified node.

1 41. A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 38.

1 42. A method comprising the computer-implemented steps of:

2   in response to a request for access to one or more XML resources from a database

3   repository within a database management system,

4   accessing, from said database management system, statistics about the

5   structure of a hierarchy in which said one or more XML resources are

6   logically organized; and

7   computing a computational cost associated with each of one or more methods

8   of accessing said one or more XML resources from said database

9   repository, based on said statistics.

50277-2433
(OID 2003-333-01)

1   43.   The method of Claim 42, wherein the step of computing a computational cost

2   comprises computing a selectivity value for each of one or more predicates, from said

3   request, that contain operators on said database repository.

1   44.   The method of Claim 42, wherein the step of computing a computational cost

2   comprises computing a computational cost of traversing, to locate particular XML

3   resources specified in said request, an index in which said XML resources are

4   indexed to said database repository.

1   45.   The method of Claim 42, wherein the step of computing a computational cost

2   comprises (a) computing a selectivity value for each of one or more predicates, from

3   said request, that contain operators on said database repository and (b) computing a

4   computational cost of traversing, to locate a particular XML resource specified in said

5   request, an index in which said XML resources are indexed to said database

6   repository.

1   46.   A computer-readable medium carrying one or more sequences of instructions which,

2   when executed by one or more processors, causes the one or more processors to

3   perform the method recited in Claim 42.

1   47.   A database system comprising:

2   an XML data repository within a relational database management system; and

3   a query optimizer that receives a database query and, in response to said query,

4   formulates a query execution plan based on computational costs of access

5   paths associated with XML data stored in said repository, wherein said

50277-2433
(OID 2003-333-01)

6   computational costs are based on statistics about an organizational structure of

7   said XML data.

1   48.   A system comprising:

2   means for gathering statistics about XML resources that are stored in a database

3   repository;

4   means for storing said statistics; and

5   means for computing, in response to a request for access to one or more XML

6   resources from said database repository and based on said statistics, a

7   computational cost associated with each of one or more methods of accessing

8   said one or more XML resources from said database repository.

50277-2433
(OID 2003-333-01)